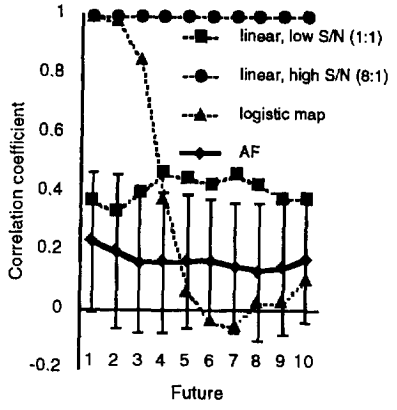
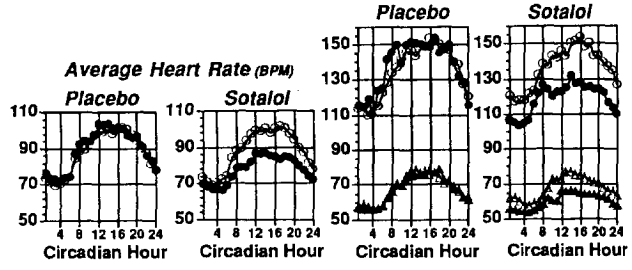
ministic (nonrandom). Although the ventricular response during atrial fibrillation (AF) is commonly described as chaotic, it has yet to be demonstrated that this represents chaos in the mathematical sense. A defining characteristic of chaotic systems is sensitive dependence on initial conditions; i.e. similar sequences evolve similarly in the near future, but then diverge exponentially. We developed a nonlinear predictive forecasting algorithm to search for evidence of short-term predictability and sensitive dependence on initial conditions in recordings of 2000 ectopy- and artifact-free RR intervals obtained during routine activity in 5 pts with AF. The algorithm: 1) uses the technique of lags to reconstruct phase spaces with embedding dimensions from 3 to 10, 2) the 3 nearest neighbors of a given trajectory are used to predict the evolution of the trajectory from 1 to 10 intervals into the future and 3) the correlation coefficient between predicted and actual evolution is computed for all RR intervals in the time series. The results were compared to test sequences from linear oscillators with high and low signal-noise ratios and a system with chaotic dynamics (the logistic map). Distinct from each of the test sets, the ventricular response in AF was only weakly predictable at all time scales, and did not exhibit sensitive dependence on initial conditions. *Conclusion:* The irregular ventricular response during AF is not governed by a low-dimensional chaotic attractor.



993-45 Atrial Fibrillation: Sotalol's Heart Rate Reductions are Selective for Circadian Hours Where Heart Rate is High

Robert G. Zoble, John A. Puleo, Jan A. Brewington, Sotalol Study Group. *University of South Florida College of Medicine, Tampa, Florida*

We used 24-hour ambulatory ECG monitoring (AEM) to determine sotalol's circadian heart rate (HR) effects in chronic atrial fibrillation. Sixty subjects on a stable digoxin dosage had AEM after one week of single-blind placebo (PLC) and then again after 2 weeks of double-blind sotalol (80 or 160 mg qd) or continued PLC. Circadian HR patterns (average, high and low) for AEM's with ≥18 paired hours (average = 23.2 hrs) were analyzed. Baseline and endpoint HR curves (open and closed symbols) are shown for sotalol and placebo groups.



Circadian HR patterns on continued placebo were stable, but sotalol produced reductions in HR which were equal for the 80 and 160 mg doses. The largest HR reductions occurred between 11 am and 7 pm, where sympathetic tone is high — consistent with sotalol's beta blocking activity. Mean reductions in 24 hour high, average and low HR were 18 BPM, 11 bpm and 7 bpm, respectively, with the high and average HR reductions being significant ($p < 0.05$).

Conclusions: Sotalol's HR lowering effects in atrial fibrillation are selective for circadian hours when HR is high, having lesser effects on low HR values. The threshold for beta blocking activity is 80 mg qd, with no further lowering seen at 160 mg qd.

994 Cardiac Catheterization and Imaging

Wednesday, March 22, 1995, 9:00 a.m.–11:00 a.m.
Ernest N. Morial Convention Center, Hall E
Presentation Hour: 10:00 a.m.–11:00 a.m.

994-92 Dotter Effect of Intravascular Ultrasound Catheters

Neil J. Weissman, Gary P. Foster, Jennifer Allen, Charles McMellon, Pedro R. Moreno, Stuart Zarich, Arthur E. Weyman, Igor F. Palacios. *Massachusetts General Hospital and Deaconess Hospital, Boston, MA*

Intravascular ultrasound (IVUS) provides unique images of the coronary artery and plaque although a study using older, larger (4.9F) IVUS catheters reported a significant Dotter effect. Subsequently, smaller and more flexible catheters have been developed but the extent of plaque disruption from these newer IVUS catheter is unknown. The purpose of this study was to determine if there is a Dotter effect from the currently used mechanical IVUS catheters. An IVUS catheter was advanced beyond a coronary lesion in 35 patients before and after a coronary intervention. A 4.3F (n = 10), 3.5F (n = 10) or 2.9F (n = 15) IVUS catheter was used. Quantitative coronary angiography was performed prior to and immediately after IVUS imaging to determine the change in maximum luminal diameter (MLD) and percent stenosis as a result of the IVUS catheter.

Results — Prior to coronary intervention, IVUS increased the MLD (0.79 ± 0.07 mm to 1.05 ± 0.08 mm, p = 0.0001) corresponding to a decrease in percent stenosis (70.3 ± 2.4% to 61.1 ± 2.8%, p = 0.001). There was a significant Dotter effect with all of the IVUS catheters. The largest increase in MLD occurred with the 3.5F catheter (0.32 ± 0.09 mm, p = 0.006) while the 2.9F catheter produced the smallest change (0.16 ± 0.14 mm, p = 0.03). MLD and percent stenosis did not change with any IVUS catheter after coronary intervention.

Conclusion — The passage of the currently used IVUS catheters mechanically alters the plaque and increases the MLD prior to a coronary intervention despite the newer, smaller design. Although there is less plaque disruption with the smallest IVUS catheters, the potential effect on the plaque must be considered prior to IVUS imaging.

994-93 Single Dose Pre-treatment Prevents Adverse Events Associated with the Use of Ionic Contrast Agents

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The use of ionic contrast (IC) is reported to have increased incidence of adverse events (AE) compared to non-ionic (NI) agents. Many of these AE may be histamine (H) mediated. A randomized double-blind study compared AE in 4 groups (75 cardiac catheterization patients each): 1) Ioxaglate (Ix) + placebo (P), 2) Ix + pre-treatment with diphenhydramine + cimetidine, 3) Iohexol (Io) + P, 4) Io + pre-treatment. Most AE were related to nausea (N), vomiting (V), urticaria (URT) and pruritis (PRU).

Pts. with	Ix + P	Ix + PT	Io + P	Io + PT
Any AE	20 (20%)*†	7 (9%) ‡	3 (4%)	2 (3%)
N & V	10 (13%)*†	3 (4%) ‡	0	0
URT & PRU	12 (16%)*†	3 (4%) ‡	3 (4%)	0

*$p < 0.02$ Ix + P vs. Ix + pre-treatment, †$p < 0.02$ Ix + P vs. Io + P, ‡ ns Ix + pre-treatment vs. Io + P

Pre-treatment with combined H_1 and H_2 blockers given 30 minutes prior to contrast injection decreased the incidence of AE with IC to an incidence similar to NI agents. *Conclusions:* Many adverse events appear to be histamine mediated. Ionic contrast may be used with a similar side effect profile to non-ionic agents.

994-94 Use of Moderately Lossy JPEG Compression Does Not Result in Loss of Diagnostic Information in Digital Coronary Angiograms

Vera H. Rigolin, Paul A. Robiolio, Bennett R. Groshong, Laurence A. Spero, Donald F. Fortin, Kenneth G. Morris, J. Kevin Harrison, Thomas M. Bashore, Jack T. Cusma. *Duke University Medical Center, Durham, NC*

Purpose: Digital image compression is a means of reducing storage and exchange requirements for coronary angiograms. In order to assess the diagnostic accuracy of image compression, digital coronary arteriograms were analyzed in compressed and noncompressed formats.